FEASIBILITY STUDY ADDENDUM

WAUKEGAN MANUFACTURED GAS AND COKE PLANT SITE
Waukegan, Illinois

Designated Storage Area Creosote Soil

WA No. 032-RSBD-05JB / Contract No. 68-W6-0025

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Executive Summary

This Addendum to the Waukegan Manufactured Gas and Coke Plant Site (WCP) Feasibility Study (FS) report (Barr, 1998) has been prepared to develop and evaluate remedial alternatives for the creosote contaminated soil present in the Designated Soil Stockpile at the WCP site in Waukegan, Illinois. Four alternatives paralleling the FS alternatives were selected for detailed analyses and subjected to evaluation under the seven National Contingency Plan (NCP) criteria.

Remedial Alternative 1—No action

The no-action alternative constitutes the absence of any remedial actions.

Remedial Alternative 2—Containment

The main components of Alternative 2 are:

- Excavation of all soils in the stockpile and thermal desorption or equivalent process in a Resource Conservation and Recovery Act (RCRA) permitted Treatment, Storage or Disposal (TSD) facility
- Disposal of treated soil in a landfill
- Demolition and disposal of storage cell
- Remediation of soils below cell consistent with FS Alternative 2

Remedial Alternative 3—Removal

The main components of Alternative 3 are:

- Excavation and treatment as necessary to meet land Disposal Restrictions (LDRs)
- Disposal of soil in Subtitle C landfill
- Demolition and disposal of storage cell
- Remediation of soils below cell consistent with FS Alternative 3
- Phytoremediation cap

The Designated Soil Stockpile soil would be removed, treated as necessary to meet LDRs for contaminated soil containing listed waste, and disposed offsite at a RCRA Subtitle C landfill. Most of the soil may not require treatment to meet LDRs for contaminated soil containing listed hazardous waste prior to disposal at a Subtitle C landfill.

Remedial Alternative 4—Aquifer Restoration

The main components of Alternative 4 are:

- Excavation and thermal desorption or equivalent process
- Disposal of treated soil in landfill
- Demolition and disposal of storage cell
- Remediation of soils below cell consistent with FS Alternative 4

This alternative is identical to Alternative 2 with the one exception that soils below the stockpile would be remediated consistent with FS Alternative 4.

Comparative Analysis

The No Action alternative is not protective of human health and the environment and may not meet Applicable or Relevant and Appropriate requirements (ARARs). As a result it is not an acceptable remedial alternative.

Remedial Alternatives 2, 3, and 4 are protective of human health and the environment because the stockpile soils are removed from the site under all three of these alternatives. The soils below the site would also be remediated to levels protective of public health and the environment if sampling detects contamination exceeding Target soil Concentrations (TSCs). Each of these three alternatives would meet all ARARs. Also each of the three alternatives maximize future site use, are protective during remediation and are implementable.

Remedial Alternative 3 is the most cost-effective remedy at about half the cost of Alternatives 2 and 4. The lower cost is largely because soil meeting LDRs for contaminated soil would be disposed directly in a Subtitle C landfill rather than being thermally treated first. Alternatives 2 and 4 result in a greater destruction of Polynuclear Aromatic Hydrocarbons (PAHs), although this is not significant relative to Alternative 3 because the PAHs have limited mobility and would be effectively and permanently contained in a hazardous waste landfill.

SECTION 1

Introduction

1.1 Purpose

This Addendum to the Waukegan Manufactured Gas and Coke Plant Site (WCP) Feasibility Study (FS) report (Barr, 1998) has been prepared to develop and evaluate remedial alternatives for the creosote contaminated soil present in the Designated Soil Stockpile at the WCP site in Waukegan, Illinois. While the FS report developed alternatives for the contaminated soil and groundwater at the WCP site, it did not specifically develop alternatives for the stockpiled creosote soil. This addendum summarizes Remedial Investigation (RI) results for the creosote soils, presents remedial objectives, and presents the development and evaluation of remedial alternatives. Due to the similarity of the contaminants present in the creosote soils with those present in the site vadose zone soils, this addendum relies on the FS to a large extent relative to screening of remedial technologies and development of alternatives.

1.2 Designated Soil Stockpile History

The site history as described in the Remedial Investigation Report (Barr, 1995) began with CT&T Wood-Treating Plant (1908 – 1917). CT&T treated railroad ties with creosote and was located on the western portion of the site. The site was acquired between 1926 and 1928 by Waukegan Manufactured Coke and Gas Plant. The plant produced coke and manufactured gas in addition to by-product production and power generation. In 1972, the coke and gas plant was dismantled by Outboard Marine Corporation (OMC) and was utilized for equipment storage, training, and public parking.

In 1990, the Waukegan Harbor Trust constructed a new boat slip (Slip No. 4) to replace Slip No. 3 which serves as a remedial action for dredged Waukegan Harbor sediments containing PCB/oil mixtures. Slip No. 4 is located on the western portion of the site and is consistent with the location of the CT&T creosote wood-treating plant (Barr, 1995, Figure 2.1-2). During the construction of Slip No. 4, the creosote-contaminated soils excavated from the vicinity of the former CT&T wood-treating plant were placed in the Designated Soil Stockpile. The Designated Soil Stockpile Storage Area is located on the west side of the property and is a lined cell intended to meet Resource Conservation and Recovery Act waste pile guidelines.

The estimated volume of contaminated soil in the stockpile is 3,100 cubic yards based on an As-Built drawing of the stockpile and a site topographic survey. This compares reasonably well with the 2,600 cy volume of excavated soil placed in the designated soil stockpile reported by the construction contractor (Canonie, 1990). The discrepancy may be related to soil expansion resulting from excavation and placement.

1.3 Report Organization

Section 1.0 of the Addendum to the FS Report describes the purpose of the report and the history of the stockpile. Section 2.0 presents the remedial action objectives and the chemical distribution in site soil. Section 3.0 discusses the development and description of remedial alternatives. The detailed analysis of the alternatives is presented in Section 4.0. The comparative analysis of alternatives is presented in Section 5.0.

SECTION 2

Remedial Action Objectives

2.1 Introduction

Development of site-specific Remedial Action Objectives (RAOs) considered Applicable or Relevant and Appropriate Requirements (ARARs), the Human Health Risk Assessment (HHRA), the Ecological Risk Assessment (ERA), and the site conceptual model. Development of RAOs for soil includes consideration of potential future risks associated with the stockpiled soil. The chemical distribution present in the designated soil stockpile is summarized followed by a summary of remedial action objectives and target soil concentrations (TSCs) that address the risks posed by the soils. The RCRA hazardous waste classification and RCRA treatment standards are also presented and discussed for the creosote contaminated soil.

2.2 Soil Chemical Distribution

Soil investigations for Slip No. 4 were performed in 1989, and the results were provided to the EPA in a report entitled "Draft Data Summary Report, New Slip Soil Investigation, Waukegan, IL" (Canonie, 1990). The soil analytical results were assessed by the Waukegan Harbor Trust and the EPA who proposed a five part per million polynuclear aromatic hydrocarbons (PAH) carcinogenic action level. The carcinogenic PAH action level was a measure used by the EPA for "designating" soils for removal and containment during the construction of the new slip.

In Phase II of the RI, three soil samples were collected from the designated stockpile to collect soil quality parameters and provide concentration data for PAHs and phenolic compounds to assess the nature of the "designated" soils as placed. The detailed analytical results are provided in Appendix 4-A of the Remedial Investigation Report (Barr, 1995) in Tables 4.1-23 – 4.1-26.

The designated soil stockpile sample total PAHs concentrations range from 194 to 221 mg/kg. Phenolic and BTEX compounds were not detected in samples from the designated soil stockpile. Detected concentrations of arsenic are 1.3 mg/kg or less. PCBs were detected in one sample at a concentration of 3 mg/kg.

Table 2-1 displays the concentrations of PAH compounds in the designated soil stockpile.

2.3 Remedial Action Objectives for Creosote Contaminated Soil

The NCP requires that a range of risks (10-4 to 10-6 excess cancer risk) be evaluated. The WCP site is located within a commercial/industrial area, and will continue to be nonresidential. As such, a higher point of departure for potential future risk may be appropriate in the development of RAOs for soil.

TABLE 2-1
Designated Soil Concentrations

Chemical	Average Concentration in Designated Soil Stockpile (mg/Kg)1	Maximum Concentration in Designated Soil Stockpile (mg/Kg)
Acenaphthene	15.5	28
Acenaphthylene	2	2.7 J
Anthracene	10.7	17
Benzo(ghi)perylene	2.4	2.6 J
Dibenzofuran	10.1	18
Flouranthene	29.8	38
Flourene	14	25
2-Methylnaphthalene	2.7	6.2
Naphthalene	7.9	19
Phenanthrene	31.3	42
Pyrene	28.7	38
Benzo (a) anthracene	11.0	18
Benzo (b) flouranthene	8.9	17
Benzo (k) flouranthene	6.9	13
Benzo (a) pyrene	6.8	12
Carbazole	1.4	2.9 J
Chrysene	12.9	21
Dibenzo (a.h) anthracene	1.1	1.5 J
Indeno (1,2,3, cd) pyrene	2.5	3.2 J

Data from Appendix 4-A of RI, average of 3 samples. J = estimated.

The RAOs developed in the FS for soil are to:

- Protect human health by reducing or eliminating exposure (direct contact, ingestion, inhalation) to soil with concentrations of contaminants representing an excess cancer risk of greater than 1x10-6 as a point of departure and a hazard index (HI) greater than 1 for reasonably anticipated future land use scenarios.
- Protect the environment by minimizing/eliminating the migration of contaminants in the soil to groundwater or to surrounding surface water bodies.

These RAOs also apply to the creosote contaminated soils of the designated soil stockpile. Development of these RAOs for soil was based on the conclusions of the HHRA and ERA,

and a review of ARARs for the Feasibility Study (Barr, 1998). This information was used to develop site-specific TSCs as further discussed in Appendices 3-B and 3-C of the Feasibility Study (Barr, 1998). The computed TSCs are based on future land use considerations that are discussed in Appendix 3-A of the Feasibility Study (Barr, 1998).

The TSCs listed are for the commercial/industrial scenario based on the FS evaluation of the most probable future land use. Table 2-2 presents the concentrations of contaminants in soil versus the reasonable maximum exposure (RME) TSCs established in the Feasibility Study.

TABLE 2-2
Designated Soil Concentrations vs. Target Soil Concentrations

Chemical	Average Concentration in Designated Soil Stockpile (mg/Kg)1	Maximum Concentration in Designated Soil Stockpile (mg/Kg)1	1 x 10 –6 RME (mg/Kg)2
Acenaphthene	15.5	28	N/A
Acenaphthylene	2	2.7 J	N/A
Anthracene	10.7	17	N/A
Benzo(ghi)perylene	2.4	2.6 J	N/A
Dibenzofuran	10.1	18	983
Flouranthene	29.8	38	N/A
Flourene	14	25	N/A
2-Methylnaphthalene	2.7	6.2	N/A
Naphthalene	7.9	19	7704
Phenanthrene	31.3	42	N/A
Pyrene	28.7	38	N/A
Benzo (a) anthracene	11.0	18	5.94
Benzo (b) flouranthene	8.9	17	5.94
Benzo (k) flouranthene	6.9	13	N/A
Benzo (a) pyrene	6.8	12	0.59
Carbazole	1.4	2.9 J	N/A
Chrysene	12.9	21	N/A
Dibenzo (a.h) anthracene	1.1	1.5 J	0.59
Indeno (1,2,3, cd) pyrene	2.5	3.2 J	5.94

Data from Appendix 4-A of RI, average of 3 samples.
RME values from FS Report (Barr, 1998) Table 3-3.

Table 2-2 displays that the soil in the Designated Soil Stockpile exceeds the commercial/industrial 1 x 10-6 RME. Benzo (a) pyrene also exceeds the 1 x 10-5 RME of 5.9 mg/kg.

Based on the comparison of the designated soil stockpile soil concentrations to the TSCs, the creosote contaminated soils pose an unacceptable risk and remediation is warranted. The estimated volume of creosote soil in the designated soil stockpile is 3,100 cy.

2.4 Hazardous Waste Classification of Creosote Contaminated Soil

The soil of the designated soil stockpile contains F034 listed hazardous waste. F034 listed waste includes process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use creosote formulations. Contaminated soil that contains listed hazardous waste is subject to all applicable requirements of RCRA until it no longer contains hazardous waste. U.S. EPA considers contaminated media to no longer contain hazardous waste when (1) they no longer exhibit a characteristic of hazardous waste; and (2) concentrations of hazardous constituents from listed hazardous wastes are below health based levels (e.g. below conservative RME direct exposure scenario concentrations) (U.S. EPA, 1998).

Soils containing listed hazardous waste are subject to the land disposal restrictions (LDRs). LDR treatment standards for contaminated soils require that contaminated soils to be land disposed be treated to reduce concentrations of hazardous constituents by 90% or meet hazardous constituent concentrations that are 10 times the universal treatment standards (UTS), whichever is greater. If the soil is also characteristic, treatment must also eliminate the hazardous characteristic. Table 2-3 presents the treatment standards for the hazardous constituents detected in the creosote soils. The average PAH concentrations of the 3 soil samples from the designated soil stockpile do not exceed 10 times the UTS. Only flouranthene in one sample exceeds 10 times the UTS. Also, based on the 3 soil sample results, it does not appear likely that the soils will be a characteristic hazardous waste. As a result it is likely that treatment will not be required for most, if not all, the soil to meet land disposal requirements prior to disposal in a Subtitle C landfill.

Treatment may still be considered as an FS Addendum alternative even if it is not specifically required to meet RCRA requirements. Treatment of the soil would be required to be in a RCRA permitted facility. Treatment by thermal desorption in a RCRA facility will likely reduce PAH concentrations to below health-based standards, thus allowing a "contained-out" determination, that is, the soils no longer are considered to contain the listed F034 hazardous waste. Assuming the soils no longer contain F034 hazardous waste, the soils can be land disposed in a Subtitle D solid waste landfill. If the treated soils meet the LDR treatment standards for contaminated soil but are above health based levels, the soil would be required to be disposed in a RCRA Subtitle C hazardous waste landfill.

TABLE 2-3
Designated Soil Concentrations vs. LDR Treatment Standards for Contaminated Soil

Chemical	Average Concentration in Designated Soil Stockpile (mg/Kg)1	Maximum Concentration in Designated Soil Stockpile (mg/Kg)1	LDR Treatment Standard 10 x UTS (mg/kg)	LDR Treatment Standard 90% Destruction (mg/Kg)
Acenaphthene	15.5	28	34	2.8
Acenaphthylene	2	2.7 J	34	0.27
Anthracene	10.7	17	34	1.7
Benzo(ghi)perylene	2.4	2.6 J	18	0.26
Dibenzofuran	10.1	18	N/A	1.8
Flouranthene	29.8	38	34	3.8
Flourene	14	25	34	2.5
2-Methylnaphthalene	2.7	6.2	N/A	0.62
Naphthalene	7.9	19	56	1.9
Phenanthrene	31.3	42	56	4.2
Pyrene	28.7	38	82	3.8
Benzo (a) anthracene	11.0	18	34	1.8
Benzo (b) flouranthene	8.9	17	68	1.7
Benzo (k) flouranthene	6.9	13	68	1.3
Benzo (a) pyrene	6.8	12	34	1.2
Carbazole	1.4	2.9 J	25	0.29
Chrysene	12.9	21	56	2.1
Dibenzo (a.h) anthracene	1.1	1.5 J	82	0.15
Indeno (1,2,3, cd) pyrene	2.5	3.2 J	34	0.32

Data from Appendix 4-A of RI, average of 3 samples.

SECTION 3

Development and Description of Alternatives

3.1 Introduction

This section presents the development and description of remedial action alternatives for the WCP designated soil stockpile. The evaluation is consistent with the information presented in Section 2, along with EPA guidance. A range of potential remedial actions is considered. Because of the similarity of contaminants in the designated soil stockpile to the vadose zone soils of the site evaluated in the FS, the early steps in the process of alternative development, development of general response actions and screening of technologies, are applicable to the designated soil stockpile and not repeated for this evaluation.

3.2 Development of Alternatives

Four remedial alternatives were developed to address the remedial objectives for the creosote contaminated soils. The four alternatives generally parallel the four FS alternatives that were developed for the site soils. With the exception of the no action alternative (Remedial Alternative 1), all the other remedial alternatives satisfy the site remedial objectives.

3.2.1 Remedial Alternative 1 No Action

The no-action alternative constitutes the absence of any remedial actions. No action is considered in this evaluation as a baseline for comparison to all other potential remedial actions as required by the NCP.

3.2.2 Remedial Alternative 2 Containment

The main components of Alternative 2 are:

- Excavation and thermal desorption or equivalent process
- Disposal of treated soil in landfill
- Demolition and disposal of storage cell
- Remediation of soils below cell consistent with FS Alternative 2

Creosote soils in the Designated Soil Stockpile would be removed and treated by thermal desorption or an equivalent process in a RCRA permitted facility. The creosote soil would be transported to the thermal desorption unit or equivalent facility by truck or barge. Following treatment, the soils would be tested and, if hazardous constituents are below health-based levels, the soils would be disposed at a Subtitle D solid waste landfill. If soils are above health-based levels, the soil would be disposed at a Subtitle C hazardous waste landfill. It is assumed for costing that disposal would be at a solid waste landfill. After the soils are removed, the designated soil stockpile cell would be demolished and disposed at an offsite solid waste landfill.

The area formerly beneath the stockpile has not been characterized because of the presence of the stockpile. Following the removal of the cell, the area would be sampled for creosote and coal tar constituents. Results would be compared against the FS TSCs. Soils exceeding the TSCs would be remediated similar to FS Alternative 2, that is, soils having PAH concentrations exceeding the PAH remediation zone TSCs would be thermally treated offsite. Soils exceeding the TSCs for the Marginal Zone Soils would be included inside the containment slurry wall. The cost estimate includes costs for sampling and analysis of soils below the stockpile but, consistent with the FS, assumes the soil does not require remediation. Following sampling, the area below the cell would be regraded and seeded or used as part of the stormwater detention pond of FS Alternative 2. This alternative is similar to Alternative 2A of the FS.

3.2.3 Remedial Alternative 3 Removal

The main components of Alternative 3 are:

- Excavation and treatment as necessary to meet LDRs
- Disposal of soil in landfill
- Demolition and disposal of storage cell
- Remediation of soils below cell consistent with FS Alternative 3
- Phytoremediation cap

The Designated Soil Stockpile soil would be removed, treated as necessary to meet LDRs for contaminated soil containing listed waste, and disposed offsite at a RCRA Subtitle C landfill. Based on the discussion presented in Section 2 on Hazardous Waste Classification of Creosote Contaminated Soil, it is assumed that most of the soil can be disposed without treatment to meet the LDR treatment standards. The cost estimate assumes that 25% of the soil (775 cys) is treated at a RCRA facility prior to disposal in a Subtitle D landfill (also assumes health-based levels are obtained in the treated soil). After the soils are removed, the designated soil stockpile cell would be demolished and disposed at an offsite solid waste landfill.

The area formerly beneath the stockpile would be sampled for creosote and coal tar constituents. Results would be compared against the FS TSCs. Soils exceeding the TSCs would be remediated similar to FS Alternative 3A, that is, soils having PAH concentrations exceeding the PAH remediation zone TSCs would be thermally treated offsite. The cost estimate includes costs for sampling and analysis of soils below the stockpile but assumes the soil does not require excavation and treatment.

Following demolition of the storage cell, a phytoremediation cap would be constructed over the footprint of the designated soil stockpile for the purpose of reducing infiltration to groundwater, preventing future direct exposure to the remaining site soils and providing for some PAH contaminant biological destruction.

Such caps have been applied for the remediation of PAH compounds. The phytoremediation cap is described in more detail in Appendix 5A of the FS. This soil alternative is similar to Alternative 3 of the FS.

3.2.4 Remedial Alternative 4 Aquifer Restoration

The main components of Alternative 4 are:

- Excavation and thermal desorption or equivalent process
- Disposal of treated soil in landfill
- Demolition and disposal of storage cell
- Remediation of soils below cell consistent with FS Alternative 4

The soil remedy of Remedial Alternative 4 includes soil removal, thermal desorption or equivalent process at a permitted RCRA facility and disposal of treated soil at a RCRA Subtitle C or D landfill. Alternative 4 is identical to Alternative 2 for the Designated Soil Stockpile.

The soils below the storage cell would be remediated consistent with FS Alternative 4. Soils exceeding the TSCs for the PAH Remediation Zone would be thermally treated and soils exceeding the Marginal Zone TSCs would be excavated, treated if necessary to meet LDRs, and disposed at a RCRA Subtitle C landfill. As in Alternative 2, for costing this alternative it is assumed that the soils below the stockpile do not exceed TSCs.

SECTION 4

Detailed Analysis of Alternatives

This section presents a detailed analysis of the Retained Alternatives for the WCP site. An evaluation of each alternative will be based on the first seven of nine NCP criteria.

The order-of-magnitude cost estimates were prepared using many of the unit costs presented in the FS (Barr, 1998). Items such as mobilization were not included in the cost estimates to avoid redundancy with the FS estimates because it is assumed that the designated soil stockpile would be remediated at the same time and by the same contractor as the vadose soils of the site. Also long-term operational costs associated with maintenance of the soil cover or cap are not included because these costs were previously included in the FS cost estimates. As a result the FS addendum alternatives do not have operation and maintenance costs, only capital cost.

4.1 Remedial Alternative 1: No Action

4.1.1 Overall Protection of Human Health and Environment

Alternative 1 is not protective of human health and the environment because of unacceptable soil exposure risks if the stockpile cover is not maintained and the cover breached. While the integrity of the designated stockpile is expected to be good in the short-term, eventually the waste pile cover would require maintenance to prevent deterioration and eventual exposure of soils to receptors.

4.1.2 Compliance with ARARs

Alternative 1 may not comply with ARARs for long-term land disposal of soil containing a listed hazardous waste. The lined storage cell was intended as short-term storage until final disposition of the soils was determined. It is possible that the soil stockpile cell could be designated as a Corrective Action management unit (CAMU), although it is uncertain whether this designation would be granted.

4.1.3 Long-Term Effectiveness and Permanence

Alternative 1 is not protective in the long-term. The long-term effectiveness of the no-action alternative is dependent on the extent to which the cover is maintained and humans and the environment are insulated from contact with the contaminants in the Designated Soil Stockpile. Natural attenuation of the PAHs is expected to be minimal in the stockpile because it is capped, preventing the necessary oxygen and moisture from entering the contaminated soil. As a result the cell would have to be maintained in perpetuity.

4.1.4 Reduction of Toxicity, Mobility, and Volume through Treatment

Alternative 1 does not include active treatment and minimal natural degradation is expected in the storage cell.

4.1.5 Short-Term Effectiveness

Alternative 1 does not require short-term actions to be implemented on the site.

4.1.6 Implementability

No implementation is required for the no action alternative.

4.1.7 Cost

The no action alternative has no direct cost.

4.1.8 State and Community Acceptance

The evaluation of state and community acceptance are conducted in the Record of Decision

4.2 Remedial Alternative 2: Containment

4.2.1 Overall Protection of Human Health and Environment

Alternative 2 is protective of human health and the environment because the contaminants are removed from the site and destroyed. Risks related to excavation and treatment of the soil can be minimized through adherence to construction health and safety plans and implementation of erosion control measures during the excavation.

Once the designated soil stockpile is removed, the native soils would be exposed at the surface. Sampling of these soils has not been performed so potential risks from exposure are unknown. However it is possible that these soils are also contaminated with PAHs and could pose unacceptable risks to human health and the environment. These potential risks would be mitigated as part of the FS alternative 2, either through excavation and offsite treatment of soils or containment within the slurry wall and asphalt cap.4.2.2 Compliance With ARARs

Alternative 2 complies with chemical specific ARARs through excavation and treatment of the soil. Chemical-specific ARARs were developed in accordance with U.S.EPA guidance and Illinois EPA TACO guidance. Action-specific ARARs for excavation and treatment will be met. Although RCRA requirements do not necessarily require the soil to be treated to meet LDRs, if it is treated it has to be at a RCRA permitted TSD facility because it contains F034 listed waste. LDRs for contaminated soil would be met through treatment prior to land disposal in a Subtitle C or D landfill. Alternative 2 would comply with chemical specific ARARs for the soil underlying the designated soil stockpile if those soils exceed the TSCs by remediating the soils consistent with FS Alternative 2.

4.2.3 Long-Term Effectiveness and Permanence

Alternative 2 consists of removal and treatment of the creosote soil. Alternative 2 is effective in the long-term and is permanent. The soil contaminants would be removed and destroyed. Residual contaminant levels in the treated soil would likely be below health-based RME levels prior to disposal in a landfill, thus minimizing long-term risk from the treated soil.

4.2.4 Reduction of Toxicity, Mobility, and Volume through Treatment

Alternative 2 effectively reduces contaminant toxicity, mobility, and volume through treatment by treating the entire volume of the stockpile. Nearly the entire PAH mass of 1700 pounds in the soils of the stockpile would be destroyed.

4.2.5 Short-Term Effectiveness

Alternative 2 includes excavation, processing, off-site shipment and treatment of creosote soil. The soil removal and treatment is a proven technology that can be implemented effectively over a short period of time.

Excavation of soil would temporarily increase the potential for exposure to materials in the soil via release of dust. Protection of remediation workers, other nearby workers, or visitors to the area may be required during implementation of the remedy to reduce the potential for exposure to contaminants via direct contact or inhalation of fugitive dust.

4.2.6 Implementability

Excavation and treatment of creosote-contaminated soil by thermal desorption is a proven technology and has been demonstrated to be effective for treating organic compounds. Sufficient capacity for treatment of the soil is available at RCRA treatment facilities.

4.2.7 Cost

The cost of Alternative 2 is presented in Table 4-1. The total capital cost has been estimated at $3.1 million.

4.2.8 State and Community Acceptance

The evaluation of state and community acceptance is conducted in the Record of Decision.

4.3 Remedial Alternative 3: Removal

4.3.1 Overall Protection of Human Health and Environment

Alternative 3 is protective of human health and the environment because the contaminants are removed from the site and contained in a landfill and it uses capping and institutional controls to eliminate direct contact with native soil potentially contaminated below the stockpile. Soils that exceed LDRs are treated prior to disposal in a landfill. The potential risks associated with the excavated soil disposed at a landfill are addressed by the engineering, monitoring, regulatory, and institutional controls associated with the disposal facilities. Disposal in a landfill is protective of human health and the environment.

Risks related to excavation of the soil can be minimized through adherence to construction health and safety plans and implementation of erosion control measures during the excavation.

Once the designated soil stockpile is removed, the native soils would be exposed at the surface. It is possible that these soils are also contaminated with PAHs and could pose unacceptable risks to human health and the environment. These potential risks would be

mitigated as part of the FS Alternative 3, either through excavation and offsite treatment of soils or through capping with a phytoremediation cap.

4.3.2 Compliance with ARARs

Alternative 3 complies with the ARARs listed in Section 3 of the FS. These ARARs are culminated in the site-specific RAOs. The components of Alternative 3 will surpass the stated RAOs by removing the soil and capping the underlying soils. Action-specific ARARs for excavation and treatment will be met. RCRA contaminated soil LDR standards will be met through treatment at a RCRA permitted TSD facility prior to disposal in a Subtitle C landfill. If the soils are treated to below RME health-base levels, a "contained-out" determination may be made, allowing the soils to be disposed in a subtitle D landfill. Alternative 3 would comply with chemical specific ARARs for the soil underlying the designated soil stockpile.

4.3.3 Long-Term Effectiveness and Permanence

The effectiveness and permanence of Alternative 3 rely upon removal of all the soil in the designated soil stockpile, followed by long-term natural attenuation supported by phytoremediation. Alternative 3 also maximizes potential future site use by removing the entire stockpile. Most of the soil will be disposed in a secure Subtitle C landfill, thus minimizing the potential for future exposure to soil contaminants. Disposal in a Subtitle C landfill is expected to be effective, particularly because the PAH contaminants have limited mobility.

A phytoremediation cap reduces residual risk by providing adequate and reliable controls for direct contact with soil and migration of contaminants from soil to groundwater. Institutional controls for soil will assure the future use of the property is compatible with the remedy.

4.3.4 Reduction of Toxicity, Mobility, and Volume through Treatment

The creosote-contaminated soil exceeding LDRs would be removed and treated off-site, which will reduce the toxicity, mobility, and the volume of contaminated soil. The amount of soil requiring treatment to meet LDRs is unknown but may be on the order of 25%. If so, about 500 lbs. of PAHs would be treated and nearly all of this 500 lbs. would be destroyed. The phytoremediation cap gradually would reduce the mobility of any remaining organic contaminants in the soils below the stockpile by binding/degradation processes enhanced by adding organic matter to the soil. Biological action in the phytoremediation cap root zone can degrade organics, which may reduce the toxicity and volume of residual organic compounds. The phytoremediation cap would minimize the net annual infiltration and migration of residual contaminants to groundwater.

4.3.5 Short-Term Effectiveness

Alternative 3 includes excavation, off-site shipment and disposal of creosote soil. The soil removal is a proven technology that can be implemented effectively over a short period of time.

Excavation of soil would temporarily increase the potential for exposure to materials in the soil via release of dust. Protection of remediation workers, other nearby workers, or visitors to the area may be required during implementation of the remedy to reduce the potential for exposure to contaminants via direct contact or inhalation of fugitive dust. The phytoremediation cap progressively increases in effectiveness at reducing infiltration for approximately 3 years, and remains at stable effectiveness thereafter.

4.3.6 Implementability

Each component of Alternative 3 has been demonstrated as a proven technology at other sites. Treatment of PAH soil by thermal desorption, if necessary to meet LDRs, is a proven technology and has been demonstrated to be effective for treating organic compounds. Evapotranspiration, the mechanism by which the phytoremediation cap reduces net annual infiltration, is a fundamental hydrologic process. Phytoremediation for organic COCs is an effective technology that has been applied at numerous sites. A phytoremediation cap can be changed to asphalt or buildings as future site development progresses.

4.3.7 Cost

The cost of Alternative 3 is presented in Table 4-2. The total capital cost of Alternative 3 has been estimated at $1.5 million.

4.3.8 State and Community Acceptance

The evaluation of state and community acceptance are conducted in the Record of Decision.

4.4 Remedial Alternative 4 Aquifer Restoration

4.4.1 Overall Protection of Human Health and Environment

Alternative 4 is protective of human health and the environment because the contaminants are removed from the site and destroyed. Risks related to excavation and treatment of the soil can be minimized through adherence to construction health and safety plans and implementation of erosion control measures during the excavation.

Once the designated soil stockpile is removed, the native soils would be exposed at the surface. It is possible that these soils are also contaminated with PAHs and could pose unacceptable risks to human health and the environment. These potential risks would be mitigated as part of the FS Alternative 4, either through excavation and offsite treatment of soils or excavation and disposal in a Subtitle C landfill.

4.4.2 Compliance with ARARs

Alternative 4 complies with chemical specific ARARs through excavation and treatment of the soil. Action-specific ARARs for excavation and treatment will be met by treating the soil at a RCRA permitted TSD facility because it contains F034 listed waste. LDRs for contaminated soil would be met through treatment prior to land disposal in a Subtitle C or D landfill. Alternative 4 would comply with chemical specific ARARs for the soil underlying the designated soil stockpile if those soils exceed the TSCs by remediating the soils consistent with FS Alternative 4.

4.4.3 Long-Term Effectiveness and Permanence

Alternative 4 consists of removal and treatment of the creosote soil. Alternative 4 is effective in the long-term and is permanent. The soil contaminants would be removed and destroyed. Residual contaminant levels in the treated soil would likely be below health-based RME levels prior to disposal in a landfill, thus minimizing long-term risk from the treated soil.

4.4.4 Reduction of Toxicity, Mobility, and Volume through Treatment

Alternative 4 effectively reduces contaminant toxicity, mobility, and volume through treatment by treating the entire volume of the stockpile. Nearly the entire PAH mass of 1700 pounds in the soils of the stockpile would be destroyed.

4.4.5 Short-Term Effectiveness

Alternative 4 includes excavation, off-site shipment and treatment of creosote soil. The soil removal and treatment is a proven technology that can be implemented effectively over a short period of time.

Excavation of soil would temporarily increase the potential for exposure to materials in the soil via release of dust. Protection of remediation workers, other nearby workers, or visitors to the area may be required during implementation of the remedy to reduce the potential for exposure to contaminants via direct contact or inhalation of fugitive dust.

4.4.6 Implementability

Excavation and treatment of creosote-contaminated soil by thermal desorption is a proven technology and has been demonstrated to be effective for treating organic compounds. Sufficient capacity for treatment of the soil is available at RCRA treatment facilities.

4.4.7 Cost

The cost of Alternative 4 is presented in Table 4-3. The total capital cost has been estimated at $3.1 million.

4.4.8 State and Community Acceptance

The evaluation of state and community acceptance is conducted in the Record of Decision.

SECTION 5

Comparative Analysis of Alternatives

5.1 NCP Criteria Evaluation

Detailed analysis of the seven NCP criteria on the four Remedial Alternatives is described in Section 4. The comparative analysis is presented below.

5.1.1 Protection of Human Health and the Environment

The No Action alternative is not protective of human health and the environment because of the unacceptable soil exposure risks if the stockpile cover is not maintained and the cover breached.

Remedial Alternatives 2, 3, and 4 are protective of human health and the environment because the stockpile soils are removed from the site under all three of these alternatives. The soils below the site would also be remediated to levels protective of public health and the environment if sampling detects contamination exceeding TSCs.

5.1.2 Compliance with ARARs

Alternative 1 may not comply with ARARs for long-term land disposal of soil containing a listed hazardous waste. The lined storage cell was intended as short-term storage until final disposition of the soils was determined. Remedial Alternatives 2, 3, and 4 meet ARARs with soil removal and remediation. Each of these three alternatives would meet RCRA requirements for contaminated soil containing listed hazardous waste.

5.1.3 Long-Term Effectiveness and Permanence

The No Action alternative is not considered protective in the long-term. Remedial Alternatives 2, 3, and 4 remove the creosote soils and either permanently treat and destroy the PAH contaminants (Alternatives 2 and 4) or permanently isolates the PAH soil contaminants in a landfill (Alternative 3). Alternative 3 is considered effective and permanent in particular because of the limited mobility of the PAHs. Remedial Alternative 3 includes the added remedial benefits of a phytoremediation cap, which further enhances the long-term effectiveness and permanence of this remedy if soils below the cap are contaminated in excess of TSCs.

5.1.4 Reduction of Toxicity, Mobility or Volume Through Treatment

The No Action alternative includes no treatment and minimal natural degradation of PAHs would be expected. Remedial Alternatives 2 and 4 would reduce contaminant toxicity, mobility, and/or volume through thermal desorption or an equivalent process. An estimated 1700 lbs. of PAHs would be treated and destroyed under these two alternatives. Remedial Alternative 3 includes soil treatment as necessary to meet LDRs. Treatment under Alternative 3 is assumed to be necessary for 25% of the stockpile soils, about 800 cys. This would result in the destruction of about 500 lbs. of PAHs.

5.1.5 Short-Term Effectiveness

The No Action alternative does not require short-term actions to be implemented at the site. In contrast, Remedial Alternatives 2, 3, and 4 include excavation of 3,100 cys of contaminated soil. Remedial Alternative 3 includes capping of the remaining soil where the Designated Soil Stockpile was located. Soil removal and capping are proven technologies that can be implemented over a short period of time.

Excavation of soil under Alternatives 2, 3 and 4 would temporarily increase the potential for exposure to materials in the soil via release of dust. Protection of remediation workers, other nearby workers, or visitors to the area may be required during implementation of these alternatives to reduce the potential for exposure to contaminants via direct contact or inhalation of fugitive dust.

5.1.6 Implementability

No implementation is required for the no action alternative. Remedial Alternatives 2, 3, and 4 are implementable. Excavation of the soil and installation of a phytoremediation cap can be easily implemented using conventional equipment and standard construction. The phytoremediation cap in Alternative 3 can be changed to asphalt or buildings to maximize future site development. The soil treatment at a RCRA TSD under Alternatives 2, 3 and 4 is readily implementable.

5.1.7 Cost

The no action alternative has no direct cost. The capital costs of the remedial alternatives are as follows:

- Remedial Alternative 2—$3,100,000
- Remedial Alternative 3—$1,500,000
- Remedial Alternative 4—$3,100,000

As discussed earlier operation and maintenance of the cover or cap remaining after the Designated Soil Stockpile is removed is included in the FS Alternative costs. As a result, it is assumed that the FS Addendum alternatives do not have operation and maintenance costs and the present worth costs are identical to the capital costs.

5.1.8 State and Community Acceptance

The evaluation of State and community acceptance is conducted in the Record of Decision.

5.2 Summary

The No Action alternative is not protective of human health and the environment and may not meet ARARs. As a result it is not an acceptable remedial alternative.

Remedial Alternatives 2, 3, and 4 are protective of human health and the environment because the stockpile soils are removed from the site under all three of these alternatives. The soils below the site would also be remediated to levels protective of public health and the environment if sampling detects contamination exceeding TSCs. Each of these three

alternatives would meet all ARARs. Also each of the three alternatives maximize future site use, are protective during remediation and are implementable.

Remedial Alternative 3 is the most cost-effective remedy at about half the cost of Alternatives 2 and 4. The lower cost is largely because soil meeting LDRs for contaminated soil would be disposed directly in a Subtitle C landfill rather than being thermally treated first. Alternatives 2 and 4 result in a greater destruction of PAHs, although this is not significant relative to Alternative 3 because the PAHs have limited mobility and would be effectively and permanently contained in a hazardous waste landfill.

SECTION 6

References

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